



## Short report

## Post-traumatic dissection of the internal carotid artery associated with ipsilateral facial nerve paralysis: Diagnostic and forensic issues



F. Makhlouf, M.D.<sup>a,\*</sup>, V. Scolan, M.D.<sup>a</sup>, O. Detante, M.D.<sup>b,c</sup>, L. Barret, M.D., PhD<sup>a</sup>,  
F. Paysant, M.D., PhD<sup>a</sup>

<sup>a</sup> Clinical Forensic Medicine Unit, Hospital of Grenoble, France

<sup>b</sup> Neurovascular Unit, Hospital of Grenoble, France

<sup>c</sup> Neurosciences Institute of Grenoble, INSERM U 836, Grenoble, France

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## ABSTRACT

Traumatic internal carotid artery dissection may result from a direct blow to anterolateral aspect of the neck, or an extreme extension and rotation of the neck. Traumas involved are variable ranging from high speed motor vehicle accident to trivial traumas. The most frequent presentations of carotid artery dissection are stroke, Hörner syndrome, and paralysis of a cranial nerve. Time of ischemic signs onset is very variable too, diverging from immediate to several months delay. We report the case of a 60-year-old woman, who was assaulted by a young man. Immediately, she complained of headache and posterior cervical pain. Three months later she developed a left hemifacial paralysis. MRI and MRA showed a dissection of the left internal carotid artery. The causal relationship between the trauma and the carotid artery dissection as well as forensic issues are discussed.

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## 1. Introduction

Internal carotid artery (ICA) dissection is an infrequent but serious complication of cranial-cervical injury. The traumas involved vary from high speed motor vehicle accidents to trivial traumas. Signs include occipital or cervical pain and ischemic signs but other uncommon signs may be observed. Time of ischemic signs onset is very variable too, diverging from immediate to several months delay. In most cases of clinical practice, the causal relationship between trauma and internal carotid artery dissection is obvious. This concerns early diagnosed cases, with severe traumas of head and neck and immediate onset of classic signs. However, in some cases the causality may be difficult to assess, mainly in cases with forensic issues.

Through a case report, this article aims to discuss the causal relationship between a trauma and a carotid artery dissection.

## 2. Case description

A 60-year-old woman with no medical history said she was attacked by a young man. She said he hit her on the occipital region, nape, and back which sent her forward. Immediately after the attack, she presented with occipital and left hemicranial headache and was admitted in an emergency department (ED). Cervical radiographs did not show bone lesions. The patient was prescribed cervical collar and analgesics for a week. She was granted a 3-day-sick leave. Afterward, the patient still presented with transient headache and neck pain relieved by treatment. Three months later, she presented with left facial paralysis. Cerebral MRI and MR angiography of the supra-aortic arteries revealed a dissection of the left extra cranial internal carotid artery, subpetrous pseudoaneurysm and left corona radiata infarction. T2 weighted-FLAIR MRI revealed hypersignals probably induced by prior microvascular damage (Fig. 1). Clinical examination at admission revealed partial Horner's syndrome and left facial paralysis mostly on the lower part of the face and with no signs of Bell's palsy. Anticoagulation was initiated and CT angiography was performed. It revealed a 3-cm-long internal carotid artery dissection to the subpetrous segment with intimal flap. Facial paralysis almost completely resolved. The patient was prescribed oral anticoagulant (warfarin) for 3 months and a follow-up MRI was scheduled. As the patient lodged a

\* Corresponding author. Emergency Department, A. Michallon Hospital, Cs 10217, 38043 Grenoble Cedex 9, France.

E-mail address: [makhloufoued@yahoo.fr](mailto:makhloufoued@yahoo.fr) (F. Makhlouf).

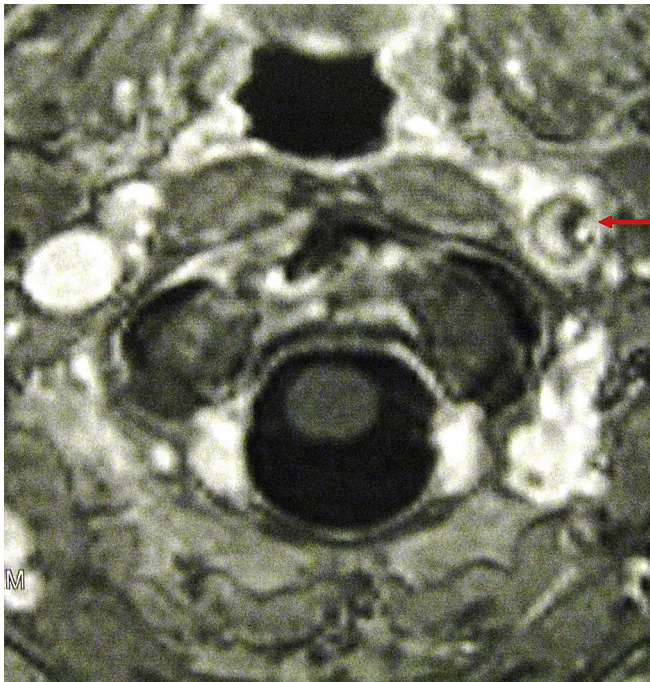


Fig. 1. Dissection of the left extra cranial internal carotid artery.

complaint of attack the causal relationship between facial paralysis and trauma was evaluated.

### 3. Discussion

#### 3.1. Trauma

The mechanism involved in indirect traumas seems to be a significant stretching of the internal carotid artery over the transverse processes of C1 and C2 vertebrae. It occurs after neck hyperextension or lateral rotation and induced intimal disruptions.<sup>1,2</sup> Motor vehicle accidents are the most common cause of ICA dissections. However, in some cases much trivial traumas are involved: chiropractic manipulations, volley-ball games, traction on dog's lead, coughing bouts,<sup>3</sup> falls in stairs,<sup>1</sup> or sneezing.<sup>4</sup>

The patient of our case-report said she was hit on the occipital region, nape and back which sent her forward. The patient's position when she was attacked was difficult to determine as nobody witnessed it. A neck hyperextension seems plausible in such a case.

#### 3.2. Delay in symptomatology

Delay in symptomatology is extremely variable. Yamada<sup>5</sup> reports a significant delay in 95% of cases. Approximately 10% of patients develop ischemic signs within one hour while 50% of patients remain asymptomatic for up to 10 h.<sup>1</sup> Pozzati<sup>6</sup> reports delays from 2 weeks to 6 months.

In 74% of cases, patients present headache and neck pain. Disruption can be dated depending on when these signs appear.<sup>3</sup>

In this case-report, the patient suffered from occipital headache and neck pain immediately after the attack. She was admitted in an emergency department and prescribed a cervical collar. As symptoms appeared rather early we may consider that they are caused by trauma.

#### 3.3. Previous state

Most of the time, carotid artery dissection is post traumatic. It is spontaneous if there are no visible signs of trauma. Rare cases

present carotid artery dissection with an arterial wall disease such as Marfan syndrome, fibromuscular dysplasia, cystic media degeneration, syphilis, Ehlers Danlos syndrome, pseudoxanthoma elasticum or atherosclerosis.<sup>7</sup> Goldstein described the case of a young adult who underwent a surgery for pseudoaneurysm and for a carotid with signs of recurrent dissections. Medical imaging did not reveal any signs of arterial abnormality. Anatomopathological examination showed fibromuscular dysplasia suggesting arterial abnormalities are an overlooked cause of ischemic attacks.<sup>8</sup>

The diagnosis is even more difficult when trauma occurs with prior arterial disease. According to Hiraiwa,<sup>9</sup> neither prior disease nor physiologic changes due to aging should be taken into account when assessing causality. They analyzed vertebrobasilar artery dissections and showed many internal elastic lamina (IEL) defects. According to the authors these disruptions are frequent in old patients. Therefore, if the victim of a trauma sustains vascular injury, a legal responsibility exists even with preexisting IEL defects.

Small hypersignals in the white matter reported in this case show preexisting microvascular damage. However, the recent corona radiata infarction parallels the left internal carotid artery dissection. As IEL defects, atherosclerosis is frequent at 60 years old. Even though contributing to vascular weakening, we think that it must not be considered responsible for the dissection.

#### 3.4. Symptoms

Frequent symptoms include hemicrania, Horner's syndrome, hemiplegia, hemianesthesia, aphasia, amaurosis and seizure.<sup>10</sup> The symptoms are related to cerebral and/or retina ischemia occurring in the territory supplied by the damaged artery. Subadventitial carotid bleeding or expansion of a dissecting aneurysm can also cause a mechanic or ischemic damage of one or several cranial nerves.<sup>10,11</sup> Indeed, Lemmerling described a case presenting with hypoglossal nerve paralysis due to traumatic internal carotid artery dissection.<sup>11</sup>

Peripheral ipsilateral facial paralysis observed in our case was due to an ischemia of the lower part of the facial nerve linked to the subpetrous pseudoaneurysm.

### 4. Conclusion

The causal relationship between trauma and internal carotid artery dissection is difficult to assess. Many different circumstances and traumas were described in the literature as the cause of traumatic ICA dissection.

In this case report, the trauma was minor and indirect and the delay was long. The causal relationship couldn't be ignored since:

- The dissection parallels the lesion mechanism;
- The patient developed headache and neck pain immediately after the attack;
- Symptoms remain until a diagnosis was established;
- Facial paralysis can plausibly be related with carotid pseudoaneurysm;
- Previous state (atherosclerosis) cannot be responsible for all the symptoms.

We don't claim the causal relationship in this case is certain. We speculate it seems plausible and coherent with the medical history. Though, this level of proof wouldn't probably be acceptable at court proceedings.

**Key points**

- Post traumatic carotid artery dissections are frequent.
- Traumas are usually violent but trivial traumas can also be involved.
- Hyperextension and rotation of the neck are the most frequent movements responsible for those kinds of dissections.
- Common symptoms include headache and neck pain. We can date the lesion depending on when they appear.
- Shorter is the delay between trauma and symptoms onset (symptoms remaining until a diagnosis is established), the more probable the causality is.
- The trauma responsibility is not excluded even if the patient presents with preexisting vascular disease (atherosclerosis for example).

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**Conflict of interest**

None.

**References**

1. Storrow AB, Smith BA. Traumatic bilateral carotid dissection. *J Emerg Med* 1995;**13**:169–74.
2. Schievink WI, Atkinson JLD, Bartleson JD, Whisnant JP. Traumatic internal carotid artery dissections caused by blunt softball injuries. *Am J Emerg Med* 1998;**16**:179–82.
3. Norris JW, Beletsky V, Nadareishvili ZG. Sudden neck movement and cervical artery dissection. *CMAJ* 2000;**163**(1):38–40.
4. Bazari F, Hind M, Ong YE. Horner's syndrome-not to be sneezed at. *Lancet* 2010;**375**:776.
5. Yamada S, Kindt JW, Youmans JR. Carotid artery occlusion due to non penetrating injury. *J Trauma* 1967;**7**:333–42.
6. Pozzati E, Giuliano G, Poppi M, Faenza A. Blunt traumatic carotid dissection with delayed symptoms. *Stroke* 1989;**20**:412–6.
7. Purvin V. Unilateral headache and ptosis in a 30-years-old woman. *Surv Ophthalmol* 1997;**42**:163–8.
8. Goldstein LB, Gray L, Hulette CM. Stroke due to recurrent ipsilateral carotid artery dissection in a young adult. *Stroke* 1995;**26**:480–3.
9. Hiraiwa K, Sato T, Sasaki T, Mizusawa I, Nata M, Kodama N. Medicolegal aspects of traumatic injury of the vertebrobasilar artery. *Neurol Med Chir* 2005;**45**:549–55.
10. Yang ST, Huang YC, Chuang CC, Hsu PW. Traumatic internal carotid artery dissection. *J Clin Neurosci* 2006;**13**:123–8.
11. Lemmerling M, Crevits L, Defreyne L, Achten E, Kunnen M. Traumatic dissection of the internal carotid artery as unusual cause of hypoglossal nerve dysfunction. *Clin Neurol Neurosurg* 1996;**98**:52–4.